

Claims

- [c1] 1. A process for forming a plurality of bumps on a wafer with an active surface, wherein the wafer further includes a passivation layer, a polymer layer and a plurality of bonding pads over the active surface, and the bonding pads are exposed by a plurality of first openings in the passivation layer and the polymer layer, the process comprising the steps of:
- forming an adhesion layer over the active surface of the wafer covering the bonding pads and the polymer layer;
 - forming a barrier layer on the adhesion layer;
 - forming a wettable layer on the barrier layer;
 - removing a portion of the wettable layer and a portion of the barrier layer such that the residual wettable layer and the residual barrier layer remain on the bonding pads;
 - forming a patterned mask layer on the adhesion layer, wherein the mask layer has a plurality of second openings that at least exposes the wettable layer;
 - performing a printing process to form a solder paste layer inside the second openings by depositing solder paste into each second opening;
 - performing a first reflow process to transform the solder paste layer inside each second opening into a bump;

removing the patterned mask layer; and
removing the adhesion layer outside the residual wettable and the residual barrier layer.

- [c2] 2. The process of claim 1, wherein after removing the adhesion layer outside the residual wettable layer and the residual barrier layer, the process further includes performing a second reflow process to treat the bumps.
- [c3] 3. The process of claim 1, wherein the adhesion layer is made of a material selected from the group consisting of titanium and aluminum.
- [c4] 4. The process of claim 1, wherein the step of removing the adhesion layer comprises using an etching solution for etching the adhesion layer.
- [c5] 5. The process of claim 4, wherein the etching solution for removing the adhesion layer does not react with the bumps.
- [c6] 6. The process of claim 1, wherein a material of the barrier layer comprises nickel–vanadium alloy.
- [c7] 7. The process of claim 1, wherein a material of the wettable layer comprises copper.
- [c8] 8. The process of claim 1, wherein the polymer layer is made of a material selected from the group consisting of

benzocyclobutene (BCB) and polyimide (PI).

- [c9] 9. The process of claim 1, wherein the bonding pads are made of a material selected from the group consisting of copper and aluminum.
- [c10] 10. The process of claim 9, wherein the under-bump-metallurgy layer is an aluminum/nickel-vanadium alloy/copper composite layer when the bonding pads are made of aluminum.
- [c11] 11. The process of claim 9, wherein the under-bump-metallurgy layer is a titanium/nickel-vanadium alloy/copper composite layer when the bonding pads are made of copper.
- [c12] 12. The process of claim 1, wherein the solder paste layer is made of a mixture that includes solder powder and flux.
- [c13] 13. A process of fabricating bumps on an active surface of a wafer, comprising the steps of:
forming a first under-bump-metallurgy layer on the active surface of the wafer;
forming a second under-bump-metallurgy layer on the first under-bump-metallurgy layer;
removing a portion of the second under-bump-metallurgy layer;

forming a patterned mask layer over the first under-bump-metallurgy layer, wherein the mask layer has a plurality of openings that at least exposes the second under-bump-metallurgy layer;
performing a printing process to deposit a solder paste layer into the openings;
performing a first reflow process to transform the solder paste layer inside the openings into bumps;
removing the first under-bump-metallurgy layer outside the residual second under-bump-metallurgy layer; and
performing a second reflow process to treat the bumps.

[c14] 14. The process of claim 13, wherein the second under-bump-metallurgy layer at least comprises a wettable layer.

[c15] 15. The process of claim 14, wherein a material of the wettable layer comprises copper.

[c16] 16. The process of claim 14, wherein the step of forming a second under-bump-metallurgy layer on the first under-bump-metallurgy layer further includes the steps of:
forming a barrier layer on the first under-bump-metallurgy layer; and
forming the wettable layer on the barrier layer.

[c17] 17. The process of claim 16, wherein a material of the

barrier layer includes nickel–vanadium alloy.

- [c18] 18. The process of claim 13, wherein the first under-bump–metallurgy layer includes an adhesion layer.
- [c19] 19. The process of claim 18, wherein the adhesion layer is made of a material selected from the group consisting of titanium and aluminum.
- [c20] 20. The process of claim 19, wherein the step of removing the adhesion layer includes using an etching solution for removing the adhesion layer.
- [c21] 21. The process of claim 18, wherein the etching solution for removing the adhesion layer does not react with the bumps.
- [c22] 22. The process of claim 13, wherein the solder paste layer is made of a mixture that includes solder powder and flux.